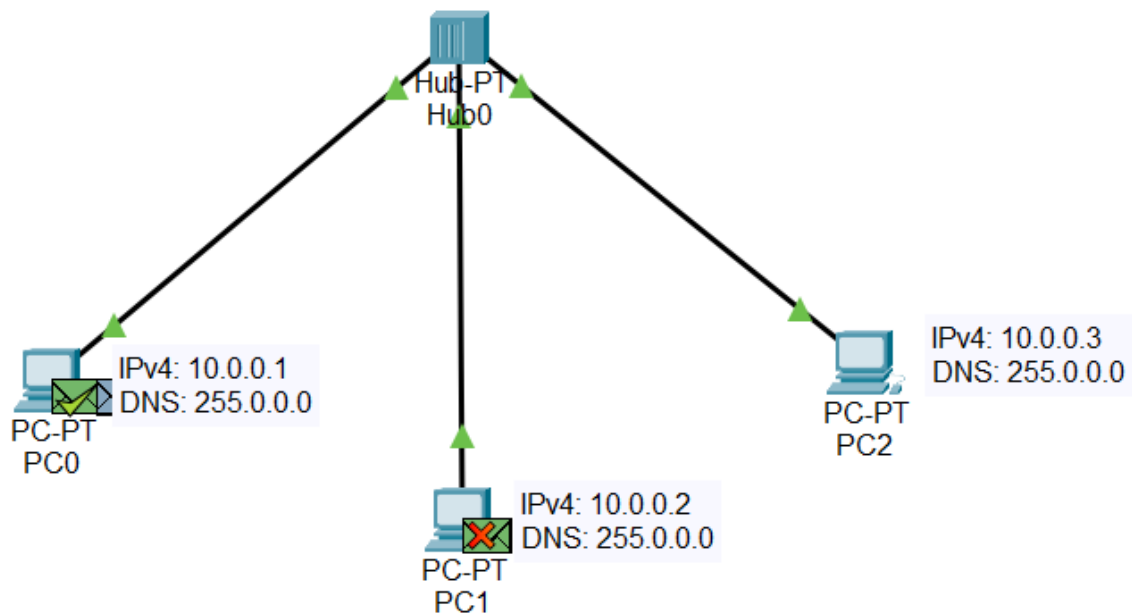




COMPUTER NETWORKS

LABORATORY PROGRAM – 1

Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)	

```
C:\>ping 10.0.0.3
```

```
Pinging 10.0.0.3 with 32 bytes of data:
```

```
Reply from 10.0.0.3: bytes=32 time=9ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time<1ms TTL=128
```

```
Ping statistics for 10.0.0.3:
```

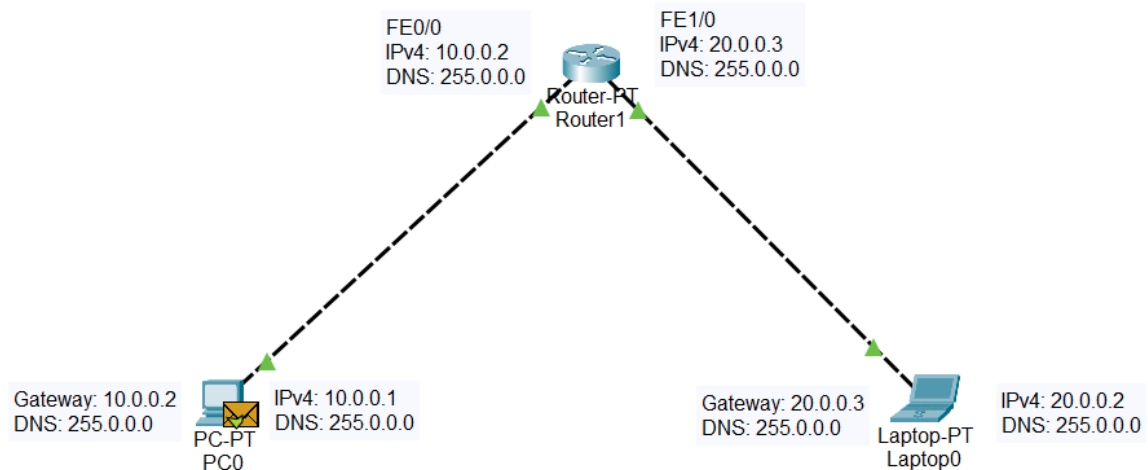
```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
    Approximate round trip times in milli-seconds:
```

```
        Minimum = 0ms, Maximum = 9ms, Average = 2ms
```

LABORATORY PROGRAM – 2

Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	
	In Progress	PC0	Laptop0	ICMP		0.000	N	1	(edit)	
	In Progress	PC0	Laptop0	ICMP		0.000	N	2	(edit)	

```
Cisco Packet Tracer PC Command Line 1.0
```

```
C:\>ping 20.0.0.3
```

```
Pinging 20.0.0.3 with 32 bytes of data:
```

```
Reply from 20.0.0.3: bytes=32 time<1ms TTL=255
```

```
Reply from 20.0.0.3: bytes=32 time<1ms TTL=255
```

```
Reply from 20.0.0.3: bytes=32 time<1ms TTL=255
```

```
Reply from 20.0.0.3: bytes=32 time<1ms TTL=255
```

```
Ping statistics for 20.0.0.3:
```

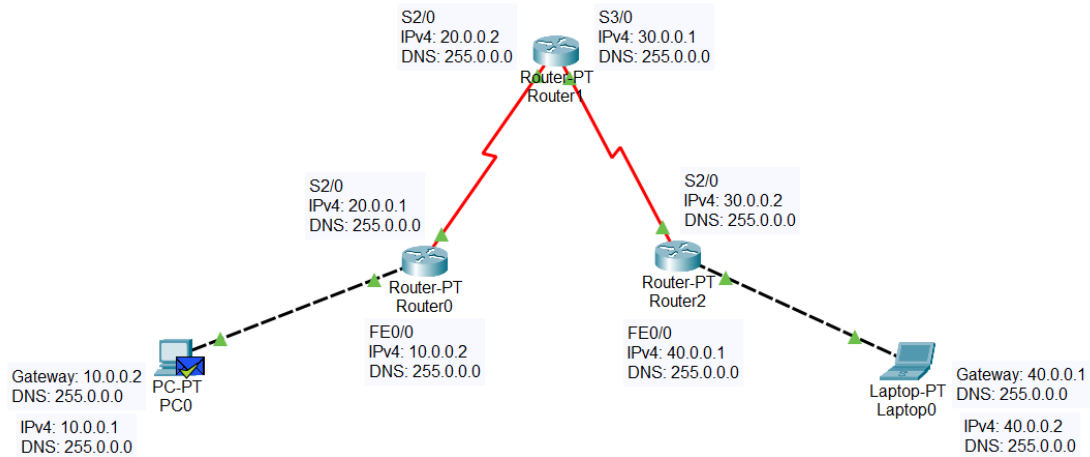
```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

LABORATORY PROGRAM – 3

Configure static route to the Router.



SHOW IP ROUTE

```
C 10.0.0.0/8 is directly connected, FastEthernet0/0
C 20.0.0.0/8 is directly connected, Serial2/0
S 30.0.0.0/8 [1/0] via 20.0.0.2
S 40.0.0.0/8 [1/0] via 20.0.0.2
```

Figure 3.1: Router0

```
S 10.0.0.0/8 [1/0] via 20.0.0.1
C 20.0.0.0/8 is directly connected, Serial2/0
C 30.0.0.0/8 is directly connected, Serial3/0
S 40.0.0.0/8 [1/0] via 30.0.0.2
```

Figure 3.2: Router1

```
S 10.0.0.0/8 [1/0] via 30.0.0.1
S 20.0.0.0/8 [1/0] via 30.0.0.1
C 30.0.0.0/8 is directly connected, Serial2/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
```

Figure 3.3: Router3.3

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 40.0.0.2

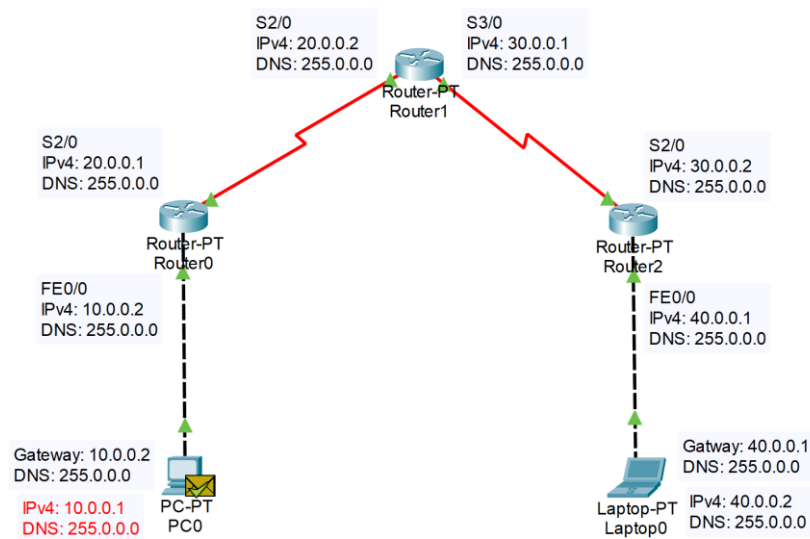
Pinging 40.0.0.2 with 32 bytes of data:

Reply from 40.0.0.2: bytes=32 time=36ms TTL=125
Reply from 40.0.0.2: bytes=32 time=34ms TTL=125
Reply from 40.0.0.2: bytes=32 time=30ms TTL=125
Reply from 40.0.0.2: bytes=32 time=26ms TTL=125

Ping statistics for 40.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 26ms, Maximum = 36ms, Average = 31ms
```

LABORATORY PROGRAM – 4(A)

Configure default route, static route to the Router.



SHOW IP ROUTE

```
Gateway of last resort is 20.0.0.2 to network 0.0.0.0
C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 20.0.0.2
```

Figure 4.1: Router0

```
S    10.0.0.0/8 [1/0] via 20.0.0.1
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
```

Figure4.2: Router1

```
Gateway of last resort is 30.0.0.1 to network 0.0.0.0
C    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 30.0.0.1
```

Figure 4.3: Router2

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	

```
C:\>ping 40.0.0.2
```

```
Pinging 40.0.0.2 with 32 bytes of data:
```

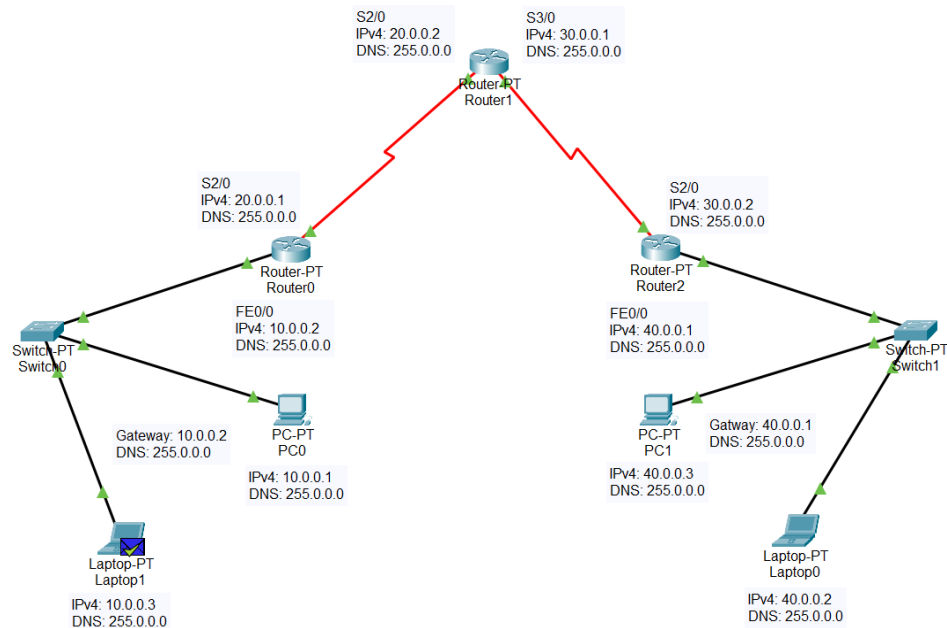
```
Reply from 40.0.0.2: bytes=32 time=34ms TTL=125
Reply from 40.0.0.2: bytes=32 time=33ms TTL=125
Reply from 40.0.0.2: bytes=32 time=30ms TTL=125
Reply from 40.0.0.2: bytes=32 time=33ms TTL=125
```

```
Ping statistics for 40.0.0.2:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 30ms, Maximum = 34ms, Average = 32ms
```

LABORATORY PROGRAM – 4(B)

Configure default route, static route to the Router, inclusive switches.



SHOW IP ROUTE

```
Gateway of last resort is 20.0.0.2 to network 0.0.0.0
C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 20.0.0.2
```

Figure 4.1: Router0

```
S    10.0.0.0/8 [1/0] via 20.0.0.1
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
```

Figure4.2: Router1

```
Gateway of last resort is 30.0.0.1 to network 0.0.0.0
C    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
S*   0.0.0.0/0 [1/0] via 30.0.0.1
```

Figure 4.3: Router2

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	

```
C:\>ping 40.0.0.3

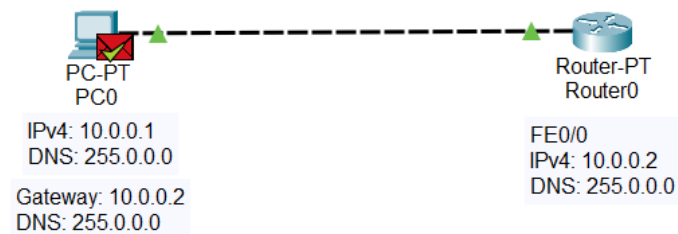
Pinging 40.0.0.3 with 32 bytes of data:

Reply from 40.0.0.3: bytes=32 time=35ms TTL=125
Reply from 40.0.0.3: bytes=32 time=37ms TTL=125
Reply from 40.0.0.3: bytes=32 time=24ms TTL=125
Reply from 40.0.0.3: bytes=32 time=38ms TTL=125

Ping statistics for 40.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 24ms, Maximum = 38ms, Average = 33ms
```

LABORATORY PROGRAM – 5

To understand the operation of TELNET by accessing the router in server room from a PC in IT office.



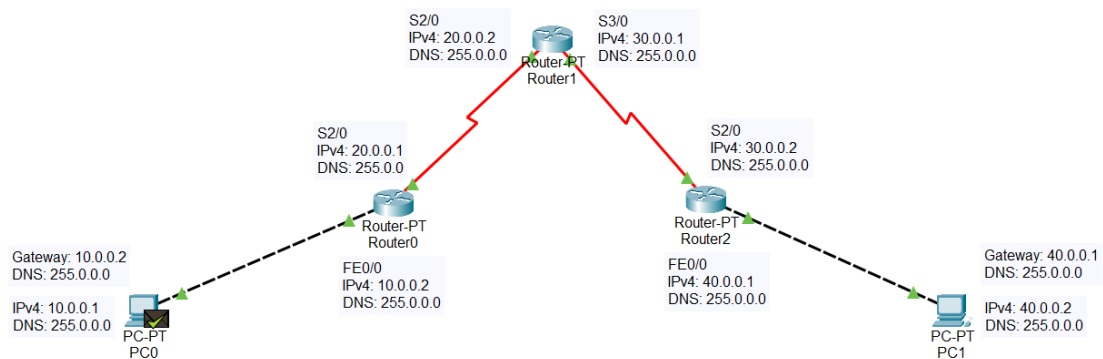
```
Router0
Physical Config CLI
IOS Command Line Interface
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-6-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
ip address 10.0.0.2 255.0.0.0
Router(config-if)#exit
Router(config)#hostname R1
R1(config)#enable secret P0
R1(config)#line vty 0 5
R1(config-line)#login
% Login disabled on line 132, until 'password' is set
% Login disabled on line 133, until 'password' is set
% Login disabled on line 134, until 'password' is set
% Login disabled on line 135, until 'password' is set
% Login disabled on line 136, until 'password' is set
% Login disabled on line 137, until 'password' is set
R1(config-line)#password P1
R1(config-line)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#
R1#wr
Building configuration...
[OK]
R1#
```

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Router0	ICMP		0.000	N	0	(edit)	

```
PC0
Physical Config Desktop Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2
Pinging 10.0.0.2 with 32 bytes of data:
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
PC>telnet 10.0.0.2
Trying 10.0.0.2 ...Open
User Access Verification
Password:
R1>enable
Password:
R1#
```

LABORATORY PROGRAM – 6

Demonstrate the TTL/ Life of a Packet.



PDU Information at Device: Router0

OSI Model [Inbound PDU Details](#) Outbound PDU Details

PDU Formats

Ethernet II		Bytes	
0	4	8	
PREAMBLE: 10101010		DEST ADDR: 000D.BD27.5B45	
SRC ADDR: 00D0.979D.0000		FCS: 0x00000000	
TYPE: 0x0800		DATA (VARIABLE LENGTH)	

IP				Bits			
0	4	8	16	20	24		
VER: 4		IHL: 5		DSCP: 0x00		TL: 28	
ID: 0x0004				FLAGS: 0x0		FRAG OFFSET: 0x000	
TTL: 255		PRO: 0x01		CHKSUM			
SRC IP: 10.0.0.1							
DST IP: 40.0.0.2							
DATA (VARIABLE LENGTH)							

ICMP		Bits	
0	8	16	

Figure 6.1: Inbound PDU, Router0

PDU Information at Device: Router0

OSI Model Inbound PDU Details [Outbound PDU Details](#)

PDU Formats

HDLC		Bits	
0	8	16	
FLG: 0x7E		ADR: 0x8f	
		CONTROL: 0x0000	
DATA (VARIABLE LENGTH)			
FCS: 0x0000		FLG: 0x7E	

IP				Bits			
0	4	8	16	20	24		
VER: 4		IHL: 5		DSCP: 0x00		TL: 28	
ID: 0x0004				FLAGS: 0x0		FRAG OFFSET: 0x000	
TTL: 254		PRO: 0x01		CHKSUM			
SRC IP: 10.0.0.1							
DST IP: 40.0.0.2							
DATA (VARIABLE LENGTH)							

Figure 6.2: Outbound PDU, Router0

PDU Information at Device: Router1

OSI Model [Inbound PDU Details](#) Outbound PDU Details

PDU Formats

HDLC		Bits	
0	8	16	
FLG: 0x7E		ADR: 0x8f	
		CONTROL: 0x0000	
DATA (VARIABLE LENGTH)			
FCS: 0x0000		FLG: 0x7E	

IP				Bits			
0	4	8	16	20	24		
VER: 4		IHL: 5		DSCP: 0x00		TL: 28	
ID: 0x0004				FLAGS: 0x0		FRAG OFFSET: 0x000	
TTL: 254		PRO: 0x01		CHKSUM			
SRC IP: 10.0.0.1							
DST IP: 40.0.0.2							
DATA (VARIABLE LENGTH)							

Figure 6.3: Inbound PDU, Router1

PDU Information at Device: Router1

OSI Model Inbound PDU Details [Outbound PDU Details](#)

PDU Formats

HDLC		Bits	
0	8	16	
FLG: 0x7E		ADR: 0x8f	
		CONTROL: 0x0000	
DATA (VARIABLE LENGTH)			
FCS: 0x0000		FLG: 0x7E	

IP				Bits			
0	4	8	16	20	24		
VER: 4		IHL: 5		DSCP: 0x00		TL: 28	
ID: 0x0004				FLAGS: 0x0		FRAG OFFSET: 0x000	
TTL: 253		PRO: 0x01		CHKSUM			
SRC IP: 10.0.0.1							
DST IP: 40.0.0.2							
DATA (VARIABLE LENGTH)							

Figure 6.4: Outbound PDU, Router1

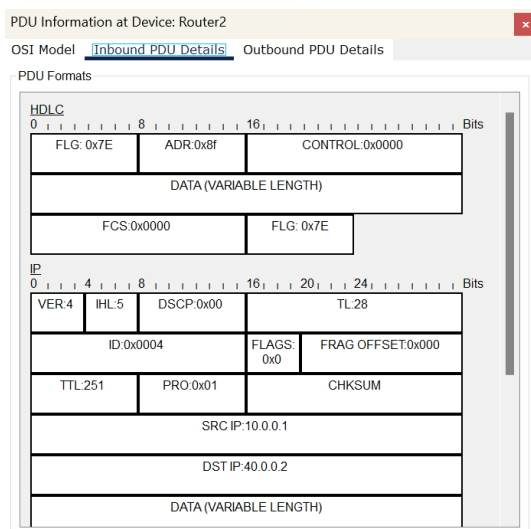


Figure 6.5: Inbound PDU, Router2

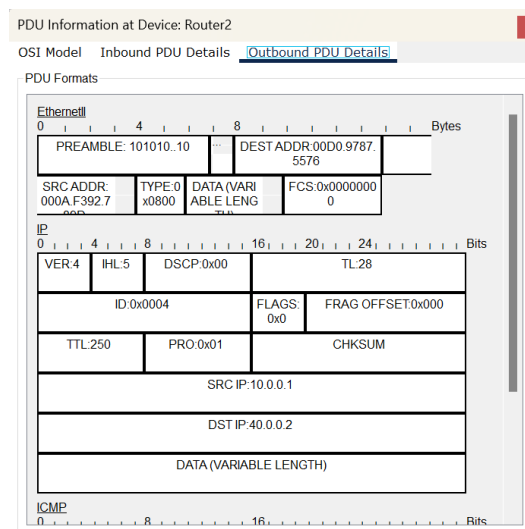


Figure 6.6: Outbound PDU, Router2

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	

```
C:\>ping 40.0.0.2

Pinging 40.0.0.2 with 32 bytes of data:

Reply from 40.0.0.2: bytes=32 time=72ms TTL=123
Reply from 40.0.0.2: bytes=32 time=53ms TTL=123
Reply from 40.0.0.2: bytes=32 time=55ms TTL=123
Reply from 40.0.0.2: bytes=32 time=69ms TTL=123

Ping statistics for 40.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 53ms, Maximum = 72ms, Average = 62ms
```


LABORATORY PROGRAM – 7(A)

To Configure IP addresses of the host using DHCP server within a LAN.

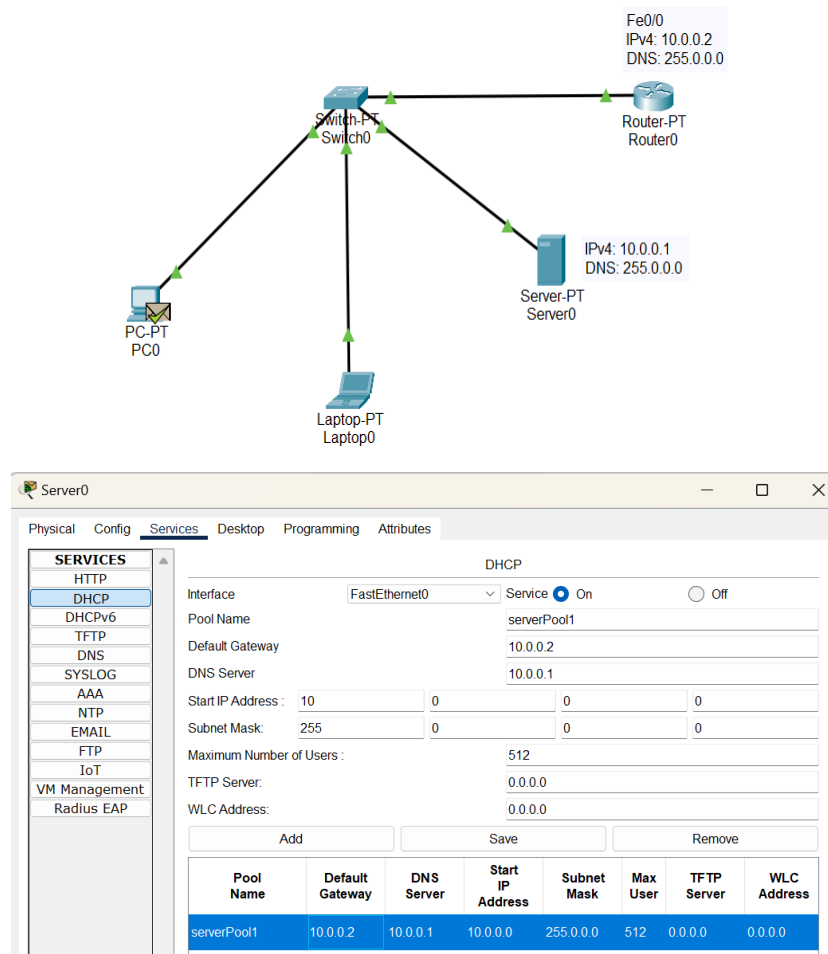


Figure 7.1: DHCP Service, Server0

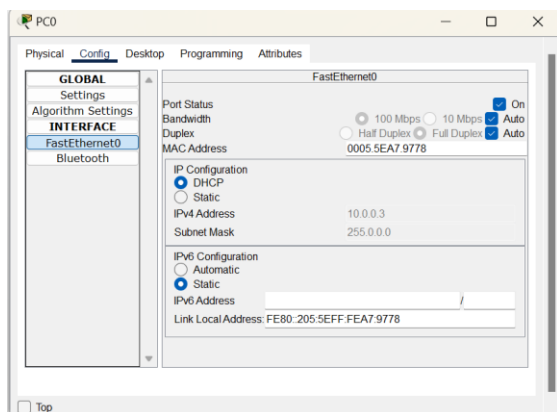


Figure 7.2: DHCP Service, PC0

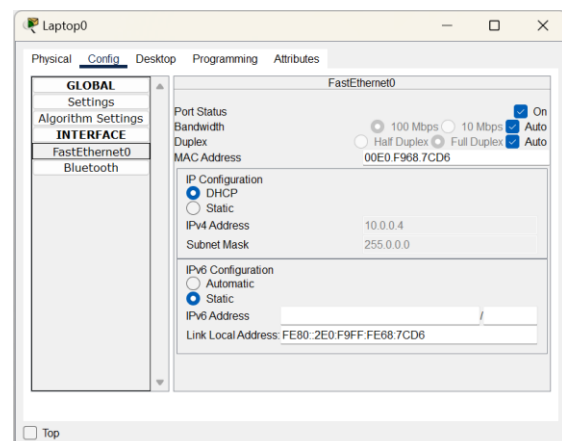





Figure 7.3: DHCP Service, Laptop0

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	

 PC0

Physical
Config
Desktop
Programming
Attributes

Command Prompt

```

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

LABORATORY PROGRAM – 7(B)

To Configure IP addresses of the host using DHCP server outside a LAN.

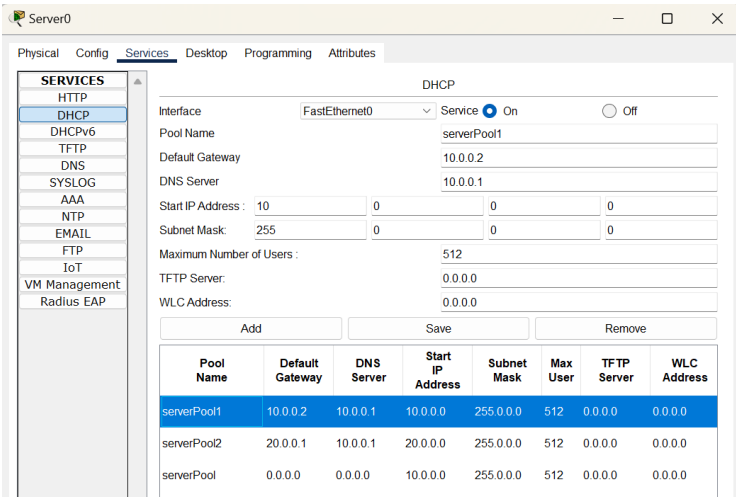
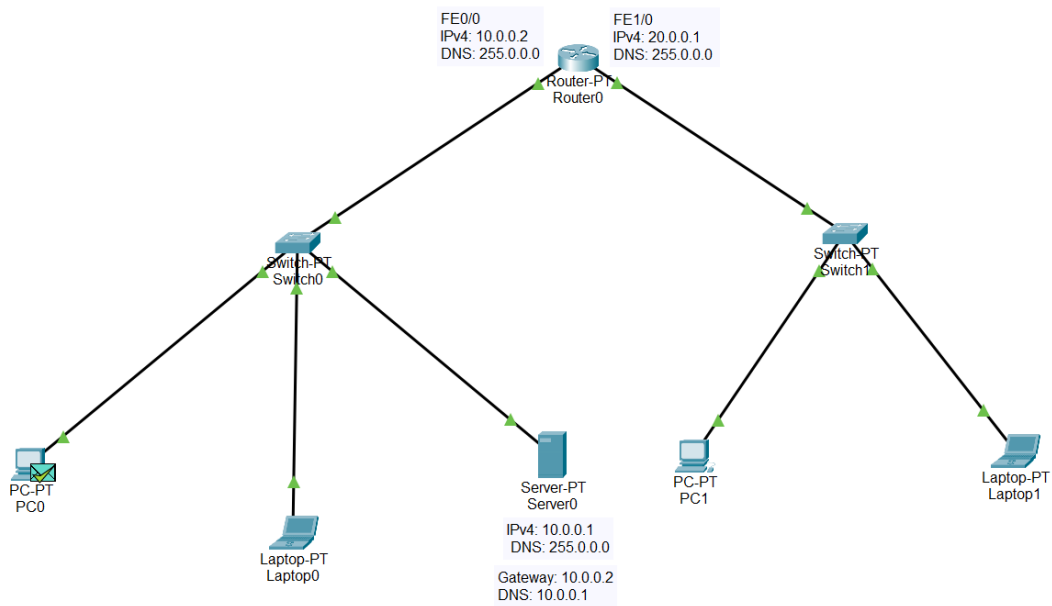


Figure 7.2.1: DHCP Service, Server0

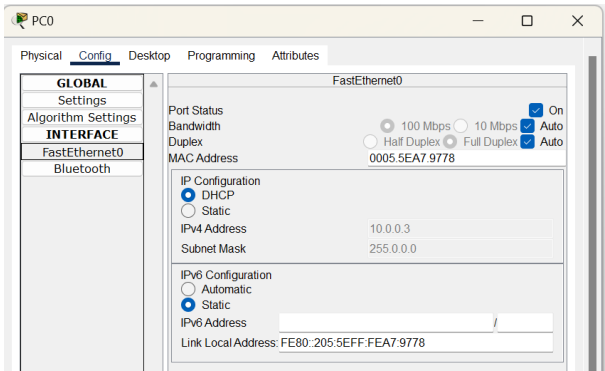


Figure 7.2.2: DHCP Service, PC0

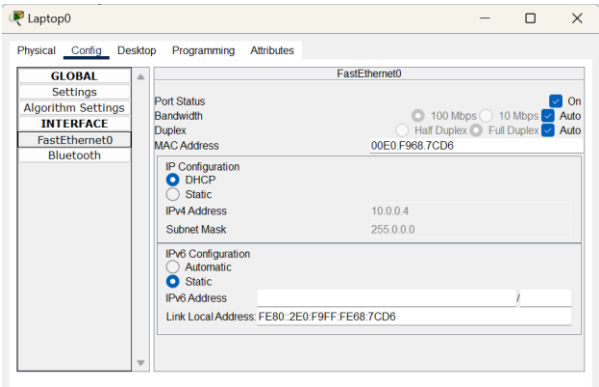


Figure 7.2.3: DHCP Service, Laptop0

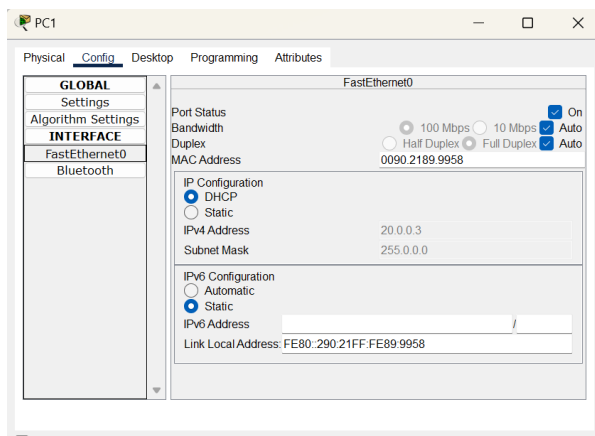


Figure 7.2.4: DHCP Service, PC1

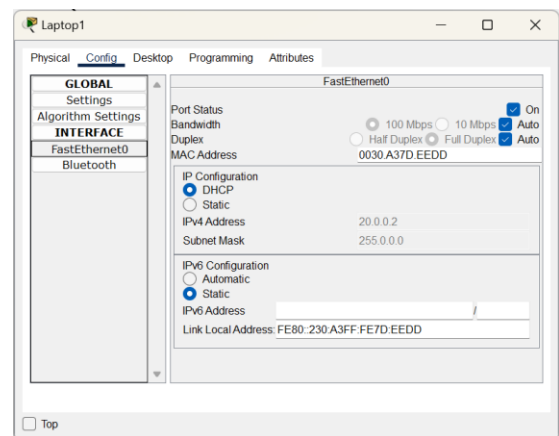


Figure 7.2.5: DHCP Service, Laptop1

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Laptop0	ICMP		0.000	N	0	(edit)	
	Successful	PC1	Laptop1	ICMP		0.004	N	1	(edit)	

LABORATORY PROGRAM – 8

To Configure DNS server to demonstrate the mapping of IP addresses and Domain names.

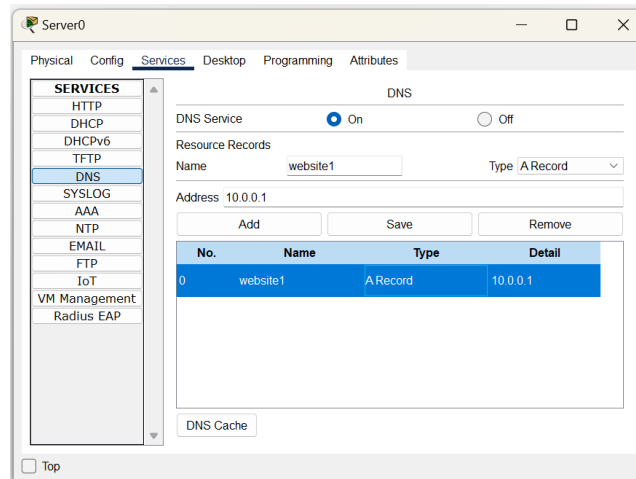
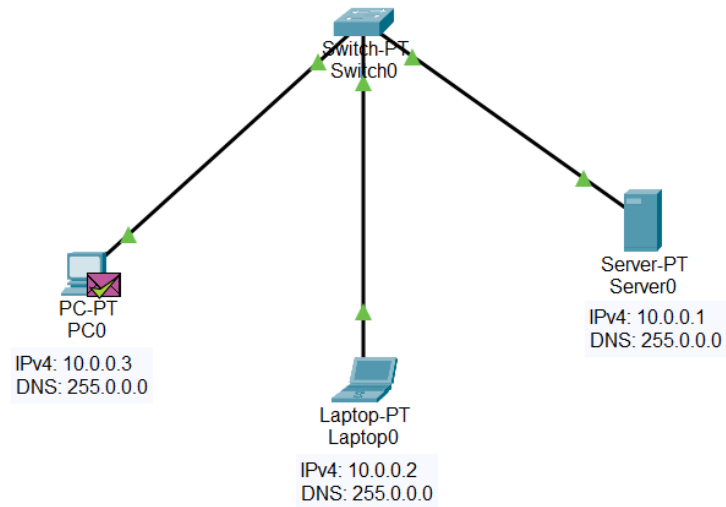


Figure 8.1: DNS Service, Server0

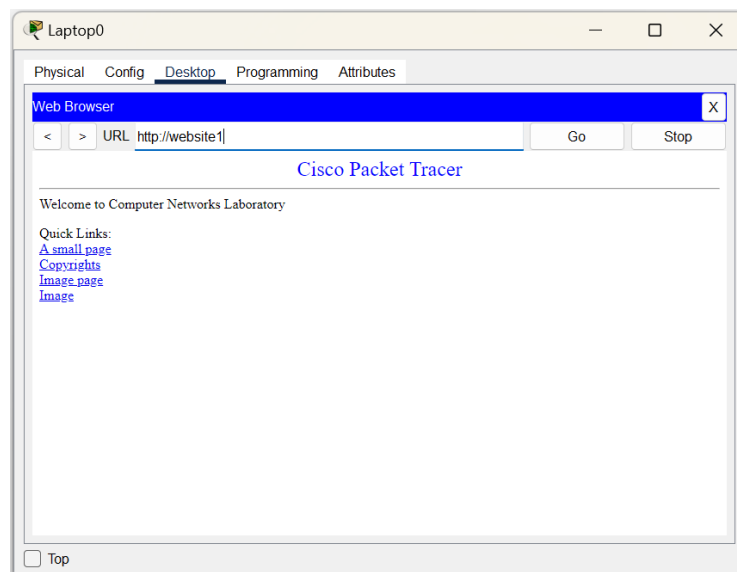


Figure 8.2: DNS Service, Laptop0